

FILE 'REGISTRY' ENTERED AT 13:17:36 ON 24 JUL 2003

=> S PHZO/CN

L1 0 PHZO/CN

=> S PHZO

L2 2 PHZO

=> D 1-2

L2 ANSWER 1 OF 2 REGISTRY COPYRIGHT 2003 ACS on STN

RN 347917-58-2 REGISTRY

CN \*\*\*Phenazine hydroxylase (Pseudomonas aureofaciens gene phzO) (9CI)\*\*\*  
(CA INDEX NAME)

OTHER NAMES:

CN GenBank AAG17551

CN GenBank AAG17551 (Translated from: GenBank AF230879)

FS PROTEIN SEQUENCE

MF Unspecified

CI MAN

SR CA

LC STN Files: CA, CAPLUS

\*\*\* STRUCTURE DIAGRAM IS NOT AVAILABLE \*\*\*

\*\*\* USE 'SQD' OR 'SQIDE' FORMATS TO DISPLAY SEQUENCE \*\*\*

1 REFERENCES IN FILE CA (1947 TO DATE)

1 REFERENCES IN FILE CAPLUS (1947 TO DATE)

L2 ANSWER 2 OF 2 REGISTRY COPYRIGHT 2003 ACS on STN

RN 292592-57-5 REGISTRY

CN \*\*\*DNA (Pseudomonas aureofaciens gene phzO plus gene ggtB fragment plus\*\*\*

\*\*\* 5'-flank) (9CI)\*\*\* (CA INDEX NAME)

OTHER NAMES:

CN GenBank AF230879

FS NUCLEIC ACID SEQUENCE

MF Unspecified

CI MAN

SR GenBank

LC STN Files: CA, CAPLUS, GENBANK

\*\*\* STRUCTURE DIAGRAM IS NOT AVAILABLE \*\*\*

\*\*\* USE 'SQD' OR 'SQIDE' FORMATS TO DISPLAY SEQUENCE \*\*\*

1 REFERENCES IN FILE CA (1947 TO DATE)

1 REFERENCES IN FILE CAPLUS (1947 TO DATE)

FILE 'CAPLUS' ENTERED AT 13:18:29 ON 24 JUL 2003

=> S L2;S PHZO

L3 1 L2

L4 1 PHZO

=> S L3,L4

L5 1 (L3 OR L4)

=> D CBIB ABS

L5 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2003 ACS on STN

2001:11561 Document No. 135:87793 \*\*\*phzO\*\*\*, a gene for biosynthesis of 2-hydroxylated phenazine compounds in *Pseudomonas aureofaciens* 30-84. Delaney, Shannon M.; Mavrodi, Dmitri V.; Bonsall, Robert F.; Thomashow, Linda S. (School of Molecular Biosciences, Washington State University, Pullman, WA, 99164-4234, USA). *Journal of Bacteriology*, 183(1), 318-327 (English) 2001. CODEN: JOBAAY. ISSN: 0021-9193. Publisher: American Society for Microbiology.

AB Certain strains of root-colonizing fluorescent *Pseudomonas* spp. produce phenazines, a class of antifungal metabolites that can provide protection against various soilborne root pathogens. Despite the fact that the phenazine biosynthetic locus is highly conserved among fluorescent

Pseudomonas spp., individual strains differ in the range of phenazine compds. they produce. This study focuses on the ability of Pseudomonas aureofaciens 30-84 to produce 2-hydroxyphenazine-1-carboxylic acid (2-OH-PCA) and 2-hydroxyphenazine from the common phenazine metabolite phenazine-1-carboxylic acid (PCA). P. aureofaciens 30-84 contains a novel gene located downstream from the core phenazine operon that encodes a 55-kDa arom. monooxygenase responsible for the hydroxylation of PCA to produce 2-OH-PCA. Knowledge of the genes responsible for phenazine product specificity could ultimately reveal ways to manipulate organisms to produce multiple phenazines or novel phenazines not previously described.

FILE 'REGISTRY' ENTERED AT 13:19:36 ON 24 JUL 2003

=> S MONOOXYGENASE/CN

L6 1 MONOOXYGENASE/CN

=> D

L6 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS on STN

RN 9038-14-6 REGISTRY

CN Oxygenase, mono- (9CI) (CA INDEX NAME)

OTHER NAMES:

CN Cytochrome P 450 hydroperoxidase

CN Cytochrome P 450 monooxygenase

CN Cytochrome P 450-linked monooxygenase

CN Cytochrome P-450 mixed-function oxidase

CN E.C. 1.14.14.1

CN E.C. 1.14.14.2

CN HCE hydroxylase

CN Microsomal monooxygenase

CN Mixed function monooxygenase

CN Mixed-function oxidase

CN Mixed-function oxygenase

CN \*\*\*Monooxygenase\*\*\*

CN Oxidase, mixed function

DR 9040-60-2, 55963-41-2, 62213-32-5

MF Unspecified

CI MAN

LC STN Files: ADISNEWS, AGRICOLA, ANABSTR, BIOBUSINESS, BIOSIS, BIOTECHNO,  
CA, CAPLUS, CASREACT, CEN, CIN, CSNB, EMBASE, IFICDB, IFIPAT, IFIUDB,  
PIRA, PROMT, TOXCENTER, ULIDAT, USPAT2, USPATFULL

\*\*\* STRUCTURE DIAGRAM IS NOT AVAILABLE \*\*\*

6475 REFERENCES IN FILE CA (1947 TO DATE)

27 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA

6480 REFERENCES IN FILE CAPLUS (1947 TO DATE)

FILE 'CAPLUS' ENTERED AT 13:20:00 ON 24 JUL 2003

=> S L6;S MONOOXYGENASE

L7 6436 L6

11775 MONOOXYGENASE

2746 MONOOXYGENASES

L8 12625 MONOOXYGENASE

(MONOOXYGENASE OR MONOOXYGENASES)

=> S L7,L8

L9 14872 (L7 OR L8)

=> S PSEUDOMONAS

64137 PSEUDOMONAS

17 PSEUDOMONADES

L10 64141 PSEUDOMONAS

(PSEUDOMONAS OR PSEUDOMONADES)

=> S L9 AND L10

L11 626 L9 AND L10

=> S FLUORESCENS;S CHLORORAPHIS;S AUREOFACIENS  
L12 6901 FLUORESCENS

L13 370 CHLORORAPHIS

L14 1468 AUREOFACIENS

=> S L10(W) (L12,L13,L14)  
L15 6578 L10(W) ((L12 OR L13 OR L14))

=> S L15 AND L9  
L16 64 L15 AND L9

=> D 1-64 TI

=> S PHENAZINE  
6674 PHENAZINE  
635 PHENAZINES  
L17 6823 PHENAZINE  
(PHENAZINE OR PHENAZINES)

=> S HYDROXY OR HYDROXYLATED  
390341 HYDROXY  
10 HYDROXIES  
390351 HYDROXY  
(HYDROXY OR HYDROXIES)  
15236 HYDROXYLATED  
L18 401560 HYDROXY OR HYDROXYLATED

=> S L18(2W)L17  
L19 31 L18(2W)L17

=> S L19 AND L10  
L20 7 L19 AND L10

=> D 3,5,6 CBIB ABS

L20 ANSWER 3 OF 7 CAPLUS COPYRIGHT 2003 ACS on STN  
1995:989009 Document No. 124:78154 Molecular analysis of genes encoding  
phenazine biosynthesis in the biological control bacterium  
\*\*\*Pseudomonas\*\*\* aureofaciens 30-84. Pierson, Leland S. III; Gaffney,  
Thomas; Lam, Stephen; Gong, Fangcheng (Department of Plant Pathology,  
University of Arizona, Tucson, AZ, 85721, USA). FEMS Microbiology  
Letters, 134(2-3), 299-307 (English) 1995. CODEN: FMLED7. ISSN:  
0378-1097. Publisher: Elsevier.

AB The DNA sequence of five contiguous open reading frames encoding enzymes  
for phenazine biosynthesis in the biol. control bacterium  
\*\*\*Pseudomonas\*\*\* aureofaciens 30-84 was detd. These open reading  
frames were named phzF, phzA, phzB, phzC and phzD. Protein PhzF is  
similar to 3-deoxy-D-arabino-heptulosonate-7-phosphate synthases of  
solanaceous plants. PhzA is similar to 2,3-dihydro-2,3-dihydroxybenzoate  
synthase (EntB) of Escherichia coli. PhzB shares similarity with both  
subunits of anthranilate synthase and the phzB open reading frame  
complemented an E. coli trpE mutant deficient in anthranilate synthase  
activity. Although phzC shares little similarity to known genes, its  
product is responsible for the conversion of phenazine-1-carboxylic acid  
to 2- \*\*\*hydroxy\*\*\* - \*\*\*phenazine\*\*\* -1-carboxylic acid. PhzD is  
similar to pyridoxamine phosphate oxidases. These results indicate that  
phenazine biosynthesis in P. aureofaciens shares similarities with the  
shikimic acid, enterochelin, and tryptophan biosynthetic pathways.

L20 ANSWER 5 OF 7 CAPLUS COPYRIGHT 2003 ACS on STN  
1991:425755 Document No. 115:25755 The formation of \*\*\*hydroxylated\*\*\*  
\*\*\*phenazines\*\*\* by \*\*\*Pseudomonas\*\*\* fluorescens Y4 upon addition  
of beryllium to the culture medium - a defense mechanism. Taraz, K.;  
Schaffner, E. M.; Budzikiewicz, H.; Korth, H.; Pulverer, G. (Inst. Org.  
Chem., Univ. Koeln, Cologne, D-5000/41, Germany). Zeitschrift fuer

• Naturforschung, C: Journal of Biosciences, 46(3-4), 194-6 (German) 1991.  
 CODEN: ZNCBDA. ISSN: 0341-0382.  
 AB \*\*\*Pseudomonas\*\*\* fluorescens Y4 grown in an iron-deficient medium  
 produces increased amts. of 2,9-di- and 2,3,9-trihydroxyphenazine-1-  
 carboxylic acid when Be<sup>2+</sup> is added to the culture. The significance of  
 the formation of these compds. is discussed.  
 L20 ANSWER 6 OF 7 CAPLUS COPYRIGHT 2003 ACS on STN  
 1977:106522 Document No. 86:106522 Synthesis of some methoxy- and  
 \*\*\*hydroxy\*\*\* - \*\*\*phenazine\*\*\* -1-carboxylic acids. Brooke, Philip  
 K.; Challand, S. Richard; Flood, Michael E.; Herbert, Richard B.;  
 Holliman, Frederick G.; Ibberson, P. Nicholas (Dep. Org. Chem., Univ.  
 Leeds, Leeds, UK). Journal of the Chemical Society, Perkin Transactions  
 1: Organic and Bio-Organic Chemistry (1972-1999) (21), 2248-52 (English)  
 1976. CODEN: JCPRB4. ISSN: 0300-922X.  
 GI

/ Structure 1 in file .gra /

AB Naturally occurring 6- and 9-hydroxyphenazine-1-carboxylic acids (I; R =  
 R1 = R3 = H, R2 = OH; R = R1 = R2 = H, R3 = OH) were prep'd. by reaction of  
 2,3-Br(O<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H with 3- and 2-MeOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, resp., followed by reductive  
 cyclization with NaBH<sub>4</sub> and demethylation with anhyd. AlCl<sub>3</sub>. Me  
 6-methoxyphenazine-1-carboxylate (I; R = Me; R1 = R3 = H, R2 = OMe) was  
 identified as a metabolite from Streptomyces luteoreticuli and a  
 metabolite of \*\*\*Pseudomonas\*\*\* aureofaciens was identified as  
 2-hydroxyphenazine-1-carboxylic acid (I; R = R2 = R3, R1 = OH) by  
 comparison with synthetic material.

=> E THOMASHOW L/AU

=> S E3-E7

1 "THOMASHOW L"/AU  
 10 "THOMASHOW L S"/AU  
 3 "THOMASHOW LINDA"/AU  
 38 "THOMASHOW LINDA S"/AU  
 1 "THOMASHOW LINDA SIBLEY"/AU

L21 53 ("THOMASHOW L"/AU OR "THOMASHOW L S"/AU OR "THOMASHOW LINDA"/AU  
 OR "THOMASHOW LINDA S"/AU OR "THOMASHOW LINDA SIBLEY"/AU)

=> E DELANEY S/AU

=> S E3,E6,E16,E18

7 "DELANEY S"/AU  
 4 "DELANEY S M"/AU  
 2 "DELANEY SHANNON"/AU  
 2 "DELANEY SHANNON M"/AU

L22 15 ("DELANEY S"/AU OR "DELANEY S M"/AU OR "DELANEY SHANNON"/AU OR  
 "DELANEY SHANNON M"/AU)

=> E MAVRODI D/AU

=> S E4ME5

L23 0 E4ME5

=> S E4,E5

6 "MAVRODI D V"/AU  
 9 "MAVRODI DMITRI V"/AU

L24 15 ("MAVRODI D V"/AU OR "MAVRODI DMITRI V"/AU)

=> E WELLER D/AU

=> S E3,E9,E14,E22

164 "WELLER D"/AU  
 16 "WELLER D M"/AU  
 1 "WELLER DAVID"/AU  
 35 "WELLER DAVID M"/AU

L25 216 ("WELLER D"/AU OR "WELLER D M"/AU OR "WELLER DAVID"/AU OR "WELLE  
 R DAVID M"/AU)

=> S L21, L22, L24, L25  
L26 255 (L21 OR L22 OR L24 OR L25)

=> S L26 AND L17  
L27 29 L26 AND L17

=> D 21, 22 CBIB ABS

L27 ANSWER 21 OF 29 CAPLUS COPYRIGHT 2003 ACS on STN

1992:525822 Document No. 117:125822 Cloning and heterologous expression of the \*\*\*phenazine\*\*\* biosynthetic locus from *Pseudomonas aureofaciens* 30-84. Pierson, Leland S., III; \*\*\*Thomashow, Linda S.\*\*\* (Root Dis. Biol. Control Res. Unit, U.S. Dep. Agric., Pullman, 99164-6430, USA). Molecular Plant-Microbe Interactions, 5(4), 330-9 (English) 1992. CODEN: MPMIEL. ISSN: 0894-0282.

AB *P. aureofaciens* strain 30-84 suppresses take-all diseases of wheat caused by *Gaeumannomyces graminis* var. *tritici*. Three antibiotics, \*\*\*phenazine\*\*\* -1-carboxylic acid, 2-hydroxyphenazine-1-carboxylic acid, and 2-hydroxyphenazine, were responsible for disease suppression. Tn5-induced mutants deficient in prodn. of one or more of the antibiotics (Phz-) were significantly less suppressive than was the parental strain. Cosmids pLSP259 and pLSP282 from a genomic library of strain 30-84 restored \*\*\*phenazine\*\*\* prodn. and fungal inhibition to 10 different Phz- mutants. Sequences required for prodn. of the \*\*\*phenazines\*\*\* were localized to a segment of .apprx.2.8 kilobases that was present in both cosmids. Expression of this locus in *Escherichia coli* required the introduction of a functional promoter, was orientation-specific, and resulted in the prodn. of all 3 \*\*\*phenazine\*\*\* antibiotics. Apparently, the cloned sequences encode a major portion of the \*\*\*phenazine\*\*\* biosynthetic pathway.

L27 ANSWER 22 OF 29 CAPLUS COPYRIGHT 2003 ACS on STN

1992:466440 Document No. 117:66440 Genetic aspects of \*\*\*phenazine\*\*\* antibiotic production by fluorescent pseudomonads that suppress take-all disease of wheat. \*\*\*Thomashow, L. S.\*\*\* ; Pierson, L. S., III (ARS, Washington State Univ., Pullman, WA, 99164-6430, USA). Current Plant Science and Biotechnology in Agriculture, 10(Adv. Mol. Genet. Plant-Microbe Interact., Vol. 1), 443-9 (English) 1991. CODEN: CPBAE2. ISSN: 0924-1949.

AB Microorganisms isolated from the rhizosphere of plants have potential value as supplements or alternatives to disease controls of soilborne pathogens that rely on chem. pesticides and cultural practices. This research has focused on the use of fluorescent pseudomonads for biol. control of take-all of wheat, caused by the fungus *Gaeumannomyces graminis* var. *tritici* (Ggt), and the mechanisms responsible for suppression. For *Pseudomonas fluorescens* 2-79 and *P. aureofaciens* 30-84, disease suppression depends largely on the prodn. of \*\*\*phenazine\*\*\* antibiotics. \*\*\*Phenazines\*\*\* are pigmented compds. with broad-spectrum activity against bacteria and fungi. For both strains, transposon Tn5 mutants defective in \*\*\*phenazine\*\*\* prodn. (Phz-) fail to inhibit ggt in vitro and are greatly reduced in their ability to suppress the disease on wheat seedlings. \*\*\*Phenazine\*\*\* -1-carboxylate (PCA) has been isolated from the roots of wheat colonized by either of these two \*\*\*phenazine\*\*\* -producing strains, and disease symptoms were significantly reduced when the antibiotic was present. This report describes two genetic loci required for the prodn. of \*\*\*phenazine\*\*\* antibiotics by strains 2-79 and 30-84. The first of these is involved in the synthesis of both Aff (nonphenazine antifungal factor) and PCA in 2-79 and may have a regulatory function, whereas the second encodes structural genes for \*\*\*phenazine\*\*\* biosynthesis in both strains.

	L #	Hits	Search Text	DBs
1	L1	0	PHZO	USPAT ; US-PG PUB
2	L2	0	PHZ ADJ O	USPAT ; US-PG PUB
3	L3	4241	PHENAZINE	USPAT ; US-PG PUB
4	L4	208654	HYDROXYLATED OR HYDROXY	USPAT ; US-PG PUB
5	L5	13	L4 ADJ2 L3	USPAT ; US-PG PUB